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REPORT NO. 88-R-01 AFPEA PROJECT NO. 87-P-130

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QUALIFICATION AND CERTIFICATION TESTS
CNU-445/E AND CNU-447/E MAVERICK MISSILE CONTAINERS

HQ AFLC/DSTZ AIR PORCE PACKAGING EVALUATION ACTIVITY Wright-Patterson AFB OH 45433-5999

December 1988



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ABSTRACT

Aeronautical Systems Division, ASD/TAML, requested assistance from the Air Force Packaging Evaluation Activity to conduct certification and qualification testing on two new aluminum Maverick missile containers.

The CNU-445/E and the CNU-447/E prototype containers were designed and fabricated by AD/YNP, Eglin AFB, FL 32542-5000. The containers are environmentally sealed with a humidity indicator, desiccant port, and a pressure relief valve. Both containers are designed to protect one AGM-65A/B/C/D/E/F/G all-up-round Maverick missile during world-wide shipment, storage, and handling. The containers will also be used for one missile without the guidance unit and for one missile without the guidance unit and the hydraulic actuation system. The CNU-445/E is the Air Force version of the container. The CNU-447/E is the Navy version and differs from the CNU-445/E only in some external Navy-specific handling features.

The test plan used for these containers was derived from ASD/TAML Specification Number CON 320 dated 22 Apr 86. An additional test, rain with wind, was added at the request of ASD/TAML. The tests were conducted in accordance with Federal Test Method Standard No. 101, Military Standard 810, Military Standard 648, Military Standard 1489, and ASD/TAML Specification Number CON 320.

Additional welds were incorporated into the CNU-447/E prototype because of cracked welds around the base of the CNU-445/E prototype. When subjected to rough handling tests there was no weld failure on the CNU-447/E. The additional welds should be added to the engineering drawings of both containers.

Results of the tests conducted on both prototype containers are acceptable. Both prototype containers will adequately protect the mentioned Maverick missile configurations during worldwide shipments in the public domain.

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TABLE OF CONTENTS

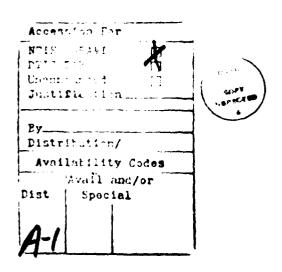
1	Page
ABSTRACT	i
TABLE OF CONTENTS	ii
INTRODUCTION	
BACKGROUND	1
PURPOSE	1
TEST SPECIMEN	1
TEST OUTLINE AND TEST EQUIPMENT	2
TEST PROCEDURES AND RESULTS	3
TEST NO. 1, INCOMING INSPECTION (CNU-445/E)	3
TEST NO. 2, LEAK TEST	3
TEST NO. 3A, EDGEWISE-DROP (ROTATIONAL) (+140°F) TEST	3
TEST NO. 3B, CORNERWISE-DROP (ROTATIONAL) (+140°F) TEST	3
TEST NO. 3C, PENDULUM-IMPACT (+140°F) TEST	3
TEST NO. 4A, EDGEWISE-DROP (ROTATIONAL) (-40°F) TEST	4
TEST NO. 4B, CORNERWISE-DROP (ROTATIONAL) (-40°F) TEST	4
TEST NO. 4C, PENDULUM-IMPACT (-40°F) TEST	4
TEST NO. 5, LEAK TEST	4
TEST NO. 6, VACUUM TEST	4
TEST NO. 7, VIBRATION FATIGUE TEST	5
TEST NO. 8, LEAK TEST	5
TEST NO. 9A, EDGEWISE-DROP (ROTATIONAL) (-40°F) TEST, LIGHT MISSILE TEST LOAD	5

TEST	NO.	9B,	CORNERWISE-DROP (ROTATIONAL) (-40°F) TEST, LIGHT MISSILE TEST LOAD	5
TEST	NO.	9C,	PENDULUM-IMPACT (-40°F) TEST, LIGHT MISSILE TEST LOAD	6
TEST	NO.	10,	COVER HANDLE PULL TEST	6
TEST	NO.	11,	STAND OFF TEST	6
TEST	NO.	12,	HOISTING TEST (1 RING)	6
TEST	NO.	13,	LEAK TEST	7
TEST	NO.	14,	VIBRATION FATIGUE TEST, LIGHT MISSILE TEST LOAD	7
TEST	NO.	15,	LOW TEMPERATURE (-65°F) TEST	7
TEST	NO.	16,	HIGH TEMPERATURE (+165°F) TEST	8
TEST	NO.	17,	PUNCTURE TEST	8
TEST	NO.	18,	STRUCTURAL INTEGRITY TEST	8
TEST	NO.	19,	LEAK TEST	8
TEST	NO.	20 A	, FORKLIFT PUSHING TEST	9
TEST	NO.	20B	, FORKLIFT TOWING TEST	9
TEST	NO.	20C	, FORKLIFT HANDLING TEST	9
TEST	NO.	21,	STACKED PENDULUM-IMPACT TEST	9
TEST	NO.	22,	TIEDOWN TEST	9
TEST	ио.	23,	REPETITIVE SHOCK (SUPERIMPOSED LOAD) TEST	10
TEST	NO.	24,	LEAK TEST	10
TEST	NO.	25,	SUPERIMPOSED LOAD (+140°F) TEST	10
TEST	NO.	26,	HOISTING STRENGTH TEST (4 RING)	11
TEST	NO.	27,	BANDED FLAT DROP TEST	11
TEST	NO.	28,	TRANSPORTABILITY TEST	11
TECT	NO	20	INCOMING INCORPORTION (CNIL-447/F)	11

TEST NO. 30, LEAK TEST	12
TEST NO. 31A, EDGEWISE-DROP (ROTATIONAL) (-40°F) TEST	12
TEST NO. 31B, CORNERWISE-DROP (ROTATIONAL) (-40°F) TEST	12
TEST NO. 31C, PENDULUM-IMPACT (-40°F) TEST	12
TEST NO. 32, MK-45 LIFTING TEST	12
TEST NO. 33, LEAK TEST	13
TEST NO. 34, CONDUCTIVE PATH TEST	13
TEST NO. 35, RAIN TEST	13
TEST NO. 36, MK-45 LIFTING TEST (REDESIGNED)	13
TEST NO. 37, HLU-216 HOISTING TEST	13
TEST NO. 38, UN DROP TESTS	14
CONCLUSIONS	14
RECOMMENDATIONS	14
TABLE 1, CONTAINER TEST PLAN	15
FIGURE 1, CNU-445/E AND CNU-447/E CORNER NUMBERING	3 3
FIGURE 2, CNU-445/E PROTOTYPE WITH HEAVY TEST LOAD	34
FIGURE 3, COVER OF CNU-445/E	34
FIGURE 4, CNU-447/E PROTOTYPE	34
FIGURE 5, CNU-447/E FORWARD CLAMP	3 5
FIGURE 6, LIGHT MISSILE TEST LOAD	35
FIGURE 7, FLIGHT TRAINER TEST LOAD	3 5
FIGURE 8, HIGH TEMPERATURE PENDULUM-IMPACT TEST	36
PIGURE 9, LOW TEMPERATURE EDGE DROP TEST	36
FIGURE 10, SET-UP FOR VIBRATION FATIGUE TEST (PRIOR TO SECURING TO TABLE)	36
FIGURE 11. COVER HANDLE PULL TEST	37

FIGURE 12,	SINGLE RING HOISTING TEST	37
FIGURE 13,	PUNCTURE RESISTANCE TEST	38
FIGURE 14,	FOUR RING HOISTING TEST	38
FIGURE 15,	BANDED FLAT DROP TEST	38
FIGURE 16,	MK-45 LIFTING TEST	39
FIGURE 17,	MK-45 LIFTING PROVISION DAMAGE	39
FIGURE 18,	CONTAINER ANGLE IN RAIN CHAMBER	39
FIGURE 19,	UN DROP TEST SET-UP	40
FIGURE 20,	UN DROP TEST SET-UP	40
DISTRIBUTIO	N LIST	41
APPENDICES.		

APPENDIX 1, AFWAL-TM-87-203-FIBT REPORT APPENDIX 2, AFSC AD/YNP LETTER 11 APR 88 APPENDIX 3, DETAILED ACCELERATION RESULTS



INTRODUCTION

BACKGROUND: Aeronautical Systems Division (ASD/TAML), Wright-Patterson AFB OH 45433-5000 requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to conduct certification and qualification testing on two new aluminum Maverick missile containers. The CNU-445/E and the CNU-447/E prototypes were designed and fabricated by AD/YNP, Eglin AFB FL 32542-5000.

<u>PURPOSE</u>: The purpose of this project was to determine if the CNU-445/E and the CNU-447/E container designs will protect the contents, the AGM-65A/B/C/D/E/F all-up-round (AUR) Maverick missile, during world-wide shipment, storage, and handling as set forth in ASD/TAML Specification Number CON 320 dated 22 Apr 86. The container will also be used for shipment, storage, and handling of a missile less the guidance unit (GU) and a missile less both the GU and the hydraulic actuation system (HAS).

TEST SPECIMEN

Two containers were sent from Eglin AFB for testing. The first container, the CNU-445/E prototype, is the Air Force version of the container and was subjected to most of the testing. The second container, the CNU-447/E prototype, is the Navy version of the container. The production versions differ only in external Navy-specific handling features. The corners of both containers were numbered counterclockwise from the aft end where the desiccant port and other accessories are located (see figure 1).

Design: The CNU-445/E and the CNU-447/E are controlled-breathing containers with a pressure relief valve, a humidity indicator, and a desiccant port. Each container is designed to limit the transmission of shocks to the missile to 30Gs when subjected to the conditions in ASD/TAML Specification CON 320. Fourteen wide-handle latches are designed to allow quick access to the container contents without the use of tools. The missile is attached to the cradle by a forward bracket and an aft strap (see figure 2). The bracket fits over the forward part of the missile and also pins into the missile itself. This bracket is attached to the cradle by two quick release pins. The strap fits between the two sets of fins on the aft end of the AGM-65 missile.

Construction: The container consists of aluminum extrusions for the exterior walls, the skids, and the missile cradle. Sheet aluminum is used for the top and bottom. Rubber pads between the missile and the cradle prevent scratching or scarring of the missile body. Four pound density polyethylene foam provides cushioning between the cradle and the floor and between the missile and the cover of the container (see figure 3). A silicone gasket provides a seal between the container base and the container cover.

The CNU-445/E prototype container differs from the proposed production container in the following aspects:

- a. The upper wall on the container cover will be one extrusion instead of an extrusion with a piece of square tubing welded on top.
- b. The forward clamp that holds the missile in place will be one extrusion instead of two extusions riveted together.
- c. The position of the attachment of the grounding strap to the container body is different.
- d. Additional welds are to be added to the interface between the lower wall and the skid.

The CNU-447/E container prototype tested incorporated all of these changes (see figures 4 and 5).

TEST OUTLINE AND TEST EQUIPMENT

Test Plan: Tests were conducted in accordance with AFPEA Test Plan 87-P-130 (see table 1). The . #sts used were selected to meet the qualification and certification requirements in ASD/TAML Specification CON 320. An additional test, the rain test, was added at the request of ASD/TAML. Test methods and procedures used were as outlined in Federal Test Method Standard No. 101 (FTMS No. 101), Military Standard 648 (MIL-STD-648), Military Standard 810 (MIL-STD-810), Military Standard 1489 (MIL-STD-1489), and ASD/TAML Specification CON 320 dated 22 Apr 86. Any modifications to the standard procedures are noted in the test plan or the results.

Test Containers: Tests 1-28 were performed on the CNU-445/E container, tests 29-37 were performed on the CNU-447/E.

Test Loads: Unless otherwise specified, all tests were conducted using the standard heavy test load weighing 670 pounds (see figure 2). Tests requiring the light missile used the light-weight missile test load weighing 330 pounds (see figure 6). The standard heavy test load became unusable during testing due to weights inside the missile breaking loose. A flight training missile weighing 660 pounds replaced the standard heavy test load where noted (see figure 7). A container base loaded to 1121 pounds, the weight of a container with a heavy load, was also used where noted to simulate a stacked container. For the UN drops only, a different heavy test load weighing 675 pounds was used.

Test Sites: Testing was conducted at: AFPEA, HQ AFLC/DSTZ, Building 70, Area C, Wright-Patterson AFB OH 45433-5999; at the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Building 65, Area B, Wright-Patterson AFB OH 45433; and at AD/YNP, Eglin AFB FL 32543-5000. Unless stated otherwise, the testing was conducted at AFPEA. The equipment required for each test is noted in the test plan.

TEST PROCEDURES AND RESULTS

1. Incoming Inspection (CNU-445/E)

Test Plan No. 1: The container, as received, was visually inspected. The exterior and interior surfaces, hardware, cushioning, and container seal were inspected. The container was also checked for weight compliance. Size compliance could not be determined since container drawings were not available. Markings could not be checked since the container was not painted.

Results: Lid weighed 157 pounds, base weighed 294 pounds, total weight of 451 pounds. The allowable total container weight was exceeded by 51 pounds (see recommendations). All required features were present.

2. Leak Test

Test Plan No. 2: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.016 psig. The results of this test are acceptable.

3. Rough Handling Tests (+140°F)

a. <u>Test Plan No. 4a</u>: The high temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 28Gs was obtained during the test.

b. <u>Test Plan No. 4b</u>: The high temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 16Gs was obtained during the test.

c. <u>Test Plan No. 4c</u>: The high temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012 (see figure 8). The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 16Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of these tests are acceptable. See appendix 3 for acceleration results.

4. Rough Handling Tests (-40°F)

a. <u>Test Plan No. 7a</u>: The low temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1 (see figure 9). The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 21Gs was obtained during the test.

b. <u>Test Plan No. 7b</u>: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 28Gs was obtained during the test.

c. <u>Test Plan No. 7c</u>: The low temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 28Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

5. Leak Test

Test Plan No. 5: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.018 psig. The results of this test are acceptable.

6. Yacuum Tost

Test Plan No. 2: The vacuum retention test was conducted in accordance with PTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.025 psig. The results of this test are acceptable.

7. <u>Vibration Fatique Test</u>

Test Plan No. 11: The vibration fatigue test was conducted in accordance with MIL-STD-648, paragraph 5.3.2 (see figure 10). The container was rigidly attached to the platform. A sinusoidal vibration excitation was applied in a vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input from 5 to 12.5 Hz was at 0.125 inch double amplitude and input from 12.5 to 50.0 Hz was at 1.0G. A 15 minute dwell test was conducted at the resonant frequency. Then a 15 minute sweep was conducted from 5 to 50 Hz at 2 minutes per octave with input as noted above.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 8Gs was obtained at 11.5 Hz. The maximum transmissibility obtained was 4.7. The results of this test are acceptable.

8. Leak Test

Test Plan No. 12: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.007 psig. The results of this test are acceptable.

9. Rough Handling Tests (-40°F), Light Missile

a. <u>Test Plan No. 15a</u>: The low temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The test load was the light-weight missile. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 29Gs was obtained during the test.

b. <u>Test Plan No. 15b</u>: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The test load was the light-weight missile. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 24Gs was obtained during the test.

c. <u>Test Plan No. 15c</u>: The low temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The test load was the light-weight missile. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 20Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

10. Cover Handle Pull Test

Test Plan No. 27: The cover handle pull test was conducted in accordance with paragraph 4.2.2.1.17 of ASD/TAML Specification Number CON 320. One handle was used to lift the 157 pound cover off the ground. A 50 pound weight was placed in the cover to give a total weight of 207 pounds. The cover was maintained in that position for 5 minutes (see figure 11).

Results: Visual inspection revealed no deflection or permanent deformation to the cover handle or the container cover. The results of this test are acceptable.

11. Stand Off Test

Test Plan No. 30: The stand off test was conducted in accordance with paragraph 4.2.2.1.18 of ASD/TAML Specification Number CON 320. The cover was set on a concrete surface with the stand offs in contact with the floor. A load of 308 pounds was then placed on top of the cover. With the load removed, the cover was then slid on the stand offs five feet in each of four directions.

Results: Visual inspection revealed no deflection or deformation with the 308 pound load on top. No physical damage resulting in a loss of functional performance was found following the sliding. The results of this test are acceptable.

12. Hoisting Test (1 ring)

Test Plan No. 25c: The single ring hoisting test was conducted in accordance with MIL-STD-648, paragraph 5.8.5. The loaded container was lifted by each of the four lift rings separately and suspended for five minutes (see figure 12).

Results: Visual inspection revealed no damage to the container caused by this test. The results of this test are acceptable. While suspended, welds that secured the skids to the container floor were found to be cracked. The welds cracked during a previous test. The CNU-447/E container will be

subjected to rough handling tests to verify that a solution has been found (see tests 31a, b, and c).

13. Leak Test

Test Plan No. 26: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.007 psig. The results of this test are acceptable.

14. Vibration Fatigue Test, Light Missile

Test Plan No. 17: The vibration fatigue test was conducted in accordance with MIL-STD-648, paragraph 5.3.2. The container was loaded with the light-weight test missile and was rigidly attached to the platform. A sinusoidal vibration excitation was applied in a vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input from 5 to 12.5 Hz was at 0.125 inch double amplitude and input from 12.5 to 50.0 Hz was at 1.0G. A 15 minute dwell test was conducted at the resonant frequency. Then a 15 minute sweep was conducted from 5 to 50 Hz at 2 minutes per octave with input as noted above.

Results: Visual inspection revealed no damage to the test load. The forward silicone pad on the container cradle was loose and came off when the missile was removed. The pad was put back on the container using RTV. No permanent damage or other problems were noticed with the container. The maximum acceleration obtained was 8Gs at the resonant frequency of 24 Hz. The maximum transmissibility obtained was 4.0. The results of this test are acceptable.

15. Low Temperature Test (-65°F)

Test Plan No. 6: The low temperature test was conducted in accordance with MIL-STD-810, Method 502.2, Procedure 1. The loaded container was placed in an environmental chamber at -65°F. After removal from the chamber, the container was allowed to reach ambient temperature before being visually examined for permanent deformation and structural failure.

Results: Visual inspection revealed no damage or permanent deformation to the container. The results of this test are acceptable.

16. High Temperature Test (+165°F)

Test Plan No. 3: The high temperature test was conducted in accordance with MIL-STD-810, Method 501.2, Procedure 1. The loaded container was placed in an environmental chamber at +165°F. After removal from the chamber, the container was allowed to reach ambient temperature before being visually examined for permanent deformation and structural failure.

Results: Visual inspection revealed no damage or permanent deformation to the container. The results of this test are acceptable.

17. Puncture Test

Test Plan No. 22: The pendulum puncture test was conducted in accordance with MIL-STD-1489, Method 505.1. The test apparatus used was a simulated forklift time weighing 70 pounds suspended by wire cables. The time was pulled straight back until it reached a height of 20 inches above its equilibrium height and released. The time impact was made to each side and end of the unrestrained container at one-half inch above the forklift pocket (see figure 13).

Results: Visual inspection revealed small areas of permanent deformation, but no functional damage to the container. The results of this test are acceptable.

18. Structural Integrity Test

Test Plan No. 35: The structural integrity test was conducted in accordance with MIL-STD-648, paragraphs 5.5.2 and 5.5.3. The pressure relief valve was removed and the loaded container was sealed. The container was pressurized to 3.5 psig. The pressure was not maintained for any length of time and leakage was not monitored. The test was conducted to determine if permanent structural deformation, deformation that prevented removal of the contents, or any potentially unsafe conditions occurred. Similarly, the container was subjected to a vacuum of -2.5 psig and observed for the same failure criteria as above.

Results: Visual inspection revealed no damage or permanent deformation to the container. The results of this test are acceptable.

19. Leak Test

Test Plan No. 22: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.002 psig. The results of this test are acceptable.

20. Mechanical Handling Tests

a. <u>Test Plan No. 24b</u>: The forklift pushing test was conducted in accordance with FTMS No. 101, Method 5011.1, paragraph 6.5.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

b. <u>Test Plan No. 24c</u>: The forklift towing test was conducted in accordance with FTMS No. 101, Method 5011.1, paragraph 6.6.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

c. <u>Test Plan No. 24a</u>: The forklift handling test was conducted in accordance with FTMS No. 101, Method 5011.1, paragraph 6.2. 1x4 inch boards were used since the forklift used has hard rubber tires. The test was performed from the side and end forklift pockets. The test was also performed from the side forklift pocket on containers stacked two high and not banded. The stacked container was the loaded container base.

Results: During the test the container configuration was stable riding on the times. Visual inspection revealed no damage to the container. The results of this test are acceptable.

21. Stacked Pendulum-Impact Test

Test Plan No. 9: The stacked pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The stacked container was the loaded container base. The test container and the loaded base were banded together. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 15Gs was obtained during the test. The results of this test are acceptable.

22. Tiedown Test

Test Plan No. 29: The tiedown strength test was conducted in accordance with MIL-STD-648, paragraphs 4.17.4 and 5.8.4. The test was conducted at the Flight Dynamics Laboratory.

Results: Visual inspection revealed no damage to the container or the test load. Procedures and results of the test are given in the AFWAL-TM-87-203-FIBT Report (see appendix 1).

The container was only subjected to a force of 1-1/2 times the gross weight in the aft direction instead of 3 times the gross weight. However, the container base is symmetrical and the force in the forward direction was 3 times the gross weight. The results of this test are acceptable.

23. Repetitive Shock Test (Superimposed Load)

Test Plan No. 13: The repetitive shock test was conducted in accordance with MIL-STD-648, paragraph 5.2.2.1 and FTMS No. 101, Method 5019.1. The stacked container was the loaded container base. The container and the loaded base were banded and placed on the platform. The containers were not attached to the platform, but restraining blocks were attached to the platform to prevent the containers from moving off the platform. The platform was vibrated at 3 to 5 Hz until the containers raised from the platform (1/16 inch feeler gauge clearance between bottom of the bottom container and the platform), or a maximum platform acceleration of 1.0G was achieved. The test was run at the determined frequency for a period of two hours.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 6Gs at 4.3 Hz was obtained during the test. The maximum transmissibility obtained was 3.2. The results of this test are acceptable.

24. Leak Test

Test Plan No. 14: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.012 psig. The results of this test are acceptable.

25. Superimposed Load Test (+140°F)

Test Plan No. 21: The superimposed load test was conducted in accordance with FTMS No. 101, Method 5016.1. A load of 10,000 pounds was placed on top of the loaded base which was on top of the test container. The total load of 11,121 pounds remained on the test container for a period of one hour while placed in an environmental chamber at 140°F.

Results: Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

26. Hoisting Strength Test (4 Ring)

Test Plan No. 25d: The 4 ring hoisting strength test was conducted in accordance with MIL-STD-648, paragraph 5.8.3. The container was loaded with 10,000 additional pounds and hoisted by all four lift points simultaneously and left hanging for five minutes (see figure 14).

Results: Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

27. Banded Flat Drop

Test Plan No. 19: The banded flat drop was conducted in accordance with MIL-STD-648, paragraph 5.2.8 except that the containers were strapped instead of banded together. The flight training missile was used as the test load. The stacked container was the loaded base. The drop height was 18 inches (see figure 15).

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 20Gs was obtained during the test. The results of this test are acceptable.

28. Transportability Test

Test Plan No. 33: Performed at Eglin AFB.

Results: See appendix 2. The results of this test are acceptable.

THE FOLLOWING TESTS WERE CONDUCTED ON THE CNU-447/E CONTAINER.

29. Incoming Inspection (CNU-447/E)

Test Plan No. 1: The container, as received, was visually inspected. The exterior and interior surfaces, hardware, cushioning, and container seal were inspected. The container was also checked for weight compliance. Size compliance could not be determined since drawings were not available for the container. Markings could not be checked since the container was not painted (see figure 4).

Results: Lid weighs 165.5 pounds, base weighs 276.5 pounds, total weight of 442 pounds. The allowable total container weight was exceeded by 42 pounds (see recommendations). All required features were present except the HLU-216 hoisting provisions.

30. Leak Test

Test Plan No. 2: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period there was no pressure loss. The results of this test are acceptable.

31. Rough Handling Tests (-40°F)

These tests were performed to verify the weld reinforcement added to the interface between the base and the skids. The acceleration of the test load was not monitored.

- a. <u>Test Plan No. 7a</u>: The low temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The height of the drop was 20 inches.
- b. <u>Test Plan No. 7b</u>: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.
- c. <u>Test Plan No. 7c</u>: The low temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

<u>Results</u>: Visual inspection revealed no damage to the container or the test load. The results of these tests are acceptable.

32. MK-45 Lifting Test

Test Plan No. 25b: The MK-45 lifting test was conducted in accordance with MIL-STD-648, paragraph 5.10. A total load of three times the gross weight of a single container was to be hoisted for five minutes. The opposite end of the container was supported on wooden blocks in order to simulate a second MK-45. The loaded base was placed on top of the loaded test container. An additional 1103 pounds placed on top of the loaded base for a total load of 3336 pounds (see figure 16).

Results: Cracks developed near the MK-45 lifting provisions as the container base was raised (see figure 17). The position of the MK-45 alignment hole was incorrect and caused the MK-45 to pull the lifting provision and the attached container wall from the rest of the container base. The results of this test are not acceptable. See test 36 for the retest.

33. Leak Test

Test Plan No. 26: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.010 psig. The results of this test are acceptable.

34. Conductive Path Test

Test Plan No. 28: The conductive path test was conducted in accordance with ASD/TAML Specification Number CON 320, paragraph 4.2.2.1.13.1. The DC resistance was measured between the missile skin and the container shell.

Results: The resistance was found to be 0.043 Ohm DC. The results of this test are acceptable.

35. Rain Test

Test Plan No. 32: The rain with wind source test was conducted in accordance with MIL-STD-810, Method 506.2, Procedure 1 except the container would not fit in the environmental chamber fully sideways. The container was subjected to a 4-inch/hour rain with 40 mph winds for one hour on each side and end (total of four hours). Figure 18 shows the extent that the container was rotated when tested sideways.

Results: Visual inspection showed no signs of water entry into the container. The results of this test are acceptable.

36. MK-45 Lifting Test

Test Plan No. 25b: Retest performed at Eglin AFB.

Results: See appendix 2. The results of this test are acceptable.

37. HLU-216 Hoisting Test

Test Plan No. 25a: Performed at Eglin AFB.

Results: See appendix 2. The results of this test are acceptable.

38. UN Drop Tests

Test Plan No. 36: The UN drop testing was conducted as follows: The CNU-447/E prototype container was used for all five drops. A Maverick test load weighing 675 pounds was secured in the container. One flat drop from 1.2 meters (3.94 feet) was made to the bottom, top, left side, and forward end of the container (see figure 19). An additional drop was made to the right rear corner of the cover. Failure criteria was spillage of the contents.

Results: Visual inspection revealed no spillage of the contents. A detailed report of the results of this test can be found in AFPEA Report No. 88-R-06 titled "Performance Oriented Packaging Testing of the CNU-445/E and CNU-447/E Aluminum Maverick Missile Container." The results of this test are acceptable.

CONCLUSIONS

The container test plan was developed to insure the containers meet the requirements of ASD/TAML Specification CON 320.

The CNU-445/E prototype container provided the specified protection for the contents. However, this container will require several modifications to achieve final production configuration (see "Construction" on page 2).

The CNU-447/E prototype container tested met or exceeded all the requirements specified.

RECOMMENDATIONS

- 1. The CNU-447/E container should be used as a baseline to generate the engineering data.
- 2. The additional welds added to the CNU-447/E around the base should remain to provide the necessary structural integrity.
- 3. The changes made to the MK-45 handling features at Eglin AFB should be incorporated into the final design.
- 4. The maximum container weight in ASD/TAML Specification CON 320 should be changed to 450 pounds.

TABLE 1. CONTAINER TEST PLAN

•	AIR FORCE PACK		-	CTIVITY	AFFEA FRO	ECT NUMBER
	((ontainer T			87-P-1	30
	NTAMER SIZE (L x W x (WEIGHT (LBS) GROSS: ITEM:	CUBE (CU. FT.	QUANTITY	DATE
		TERIOR: 28.5x30	UNUSS: //Em:			18 Mar 88
TEM N			MAN	UFACTURER		10 1142 00
AGM:	-65 Maverick Mis	sile				
CONTAI	NER NAME	-	•	T C	ONTAINER CO	BT
	-445/E and CNU-4	47/E	_			
	ESCRIPTION					
	minum Container			-	• •	
	noted below.					
	REF STD/SPEC	T	er mer en signe e majorio sur l'el le le l'imperio			T
TEST NO.	AND TEST METHOD OR PROCEDURE NO'S	TEST T	TLE AND PARAMETER		NTAINER ENTATION	MSTRU- MENTATION
	WEIGHT TEST	• :	والمستقدية والمستوار والمس	1		-
1.	*(4.2.2.1.14)	Contain	er cover weigh	t Fully	assem-	Scale
			ot be greater	bled o	container	
			0 lbs. Total	includ	-	1
			er weight shou		vibra-	
		not be	greater than	tion		
		400 LDS	•	and st	raps.	
2.	LEAK TEST	\$				
	FED-STD-101	Pneumat	ic pressure at	Test a	it ambi-	Water
	Method 5009.2		I and vacuum		ondition	manometer
	(4.2.2.1.12)		on at -1.50 PS			
			ration to be a	•		
			of 30 minutes rate shall no	• • •	//vacuum	
			0.05 PSI/HR af			
			ture stabiliza			
		tion.**				
3.	HIGH TEMPERATUR	E TEST (+165 ⁰ F)			
	MIL-STD-810		on at +165°F f	or Test v	vith	Visual
	Method 501.2	not les	s than 24 hour	s. heavi	est all-	inspection
	Procedure 1		hall be no per			-
	(4.2.2.1.4)		deformation		missile	
		· ·	ontainer is	load.		
		tempera	o ambient			
		cempera	cure.			
						T.
				4		Ì
COMME	NTS: . Pinnes in	; narenth	esis refer to	navagranh	n 100/m2	1 4T
	Specificat			haradrabu ;	עני/עפא זוו	ı,
	* In accordance	with MIL		ies terall	leak test	s herein).
PREPAR	W Karry Nu	went	APPRO	Tille.	Tren	4
_	y Nugent, Mechan					m Br., AFPE

APPEA PROJECT NUMBER AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan) 87-P-130 CONTAINER SIZE (L x W x D)(SICHES) WEIGHT (LBS) CUBE (CU. FT.) QUANTITY DATE MITERIOR. EXTERIOR: GROSS: ITEM: 108x28.5x30 18 Mar 88 ITEM NAME MANUFACTURER AGM-65 Maverick Missile CONTAINER NAME CONTAINER COST CNU-445/E and CNU-447/E PACK DESCRIPTION Aluminum Container CONDITIONING As noted below. REF STO/SPEC TFST CONTAINER AND TEST METHOD OR PROCEDURE NO'S TEST TITLE AND PARAMETERS **ORIENTATION** ROUGH HANDLING TESTS (HIGH TEMPERATURE +1 a. FED-STD-101 Test performed Cornerwise-drop Tri-axial Method 5005.1 (rotational) test. in chamber. accelero-Condition at +140°F for One drop on (4.2.2.1.6)meters not less than 24 hours. diagonal Drop height 20 inches. bottom cor-Peak resultant acceleraners, total of tion shall not exceed two drops. 30Gs. Test with heaviest AUR. b. FED-STD-101 Edgewise-drop Test performed Tri-axial Method 5008.1 (rotational) test. in chamber. accelero-Condition at +140°F for (4.2.2.1.6)One drop on meters not less than 24 hours. two adjacent Drop height 20 inches. bottom edges, Peak resultant acceleratotal of two drops. ** Te tion shall not exceed Test 30Gs. w/heaviest AUR c. FED-STD-101 Pendulum-impact test. One impact on Tri-axial Condition at +165°F. each side and Method 5012 acceleroeach end, (4.2.2.1.6)Temperature of shock meters. mitigation system at total of four Thermotime of test shall be impacts. couples +140,+10,-0°F. Impact Test with velocity 7 ft/sec*1 heaviest AUR. drop height 9 inches. Peak resultant acceleration shall not exceed 30Gs. COMMENTS: * Remaining corner drops to be performed in Test No. 7a. ** Remaining edge drops to be performed in Test No. 7b. *** Impact velocity revised per ASD/TAML letter dated 24 Aug 87. Larry Nugent, Mechanical Engineer RALPH ZYNDA, Chief, Design Br., AFPEA

16

PAGE 2 of 18

AFALD LIFL 4

		(C	ontainer T	est Plan)			87-P-	130
CO	STANCE SIZE	LxWxD) (MCHES)	WEIGHT	(LBS)	CUBE (CU. F	T.) QUANTITY	
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		108%	8.5x30	1 1	1	1	1	18 Mar 8
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	65 Maveri MER NAME	CK M188	3116					
		ONT! 44	17 /n				CONTAINER CO)8 T
	445/E and ESCRIPTION	CNU-44	1//E		-			
		-1						
	inum Cont	ainer				-		
	OMMG							
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EST 10.	REF STD/S AND TEST ME PROCEDURE	THOD OR	TEST T	ITLE AND PA	RAMETERS		ONTAINER RENTATION	MSTRU- MENTATION
5.	LEAK TEST					• •	-	
	FED-STD-1			ic press			ent	Water
ŀ	Method 50 (4.2.2.1.			I. Test s than 1		on		manometer
	(4.2.2.1.	12)		. Leaka	5			
		:		ot exceed		:		
				after te	mperatu	re		
			stabili:	zation.				
.	LOW TEMPE	RATURE	TEST (-	65 ⁰ F)				
	MIL-STD-8	10	Condition	on at -69			with	Visual
	Method 50			s than 2		. heavi	est AUR.	inspection
	Procedure (4.2.2.1.			hall be : nt defor	-			
	(٠,	•	ontainer		en		
			to ambi	ent temp	erature	•		
7.	ROUGH HAN	DLING 1	rests (L	OW TEMPE	RATURE	-40 [©] F)		
a.	FED-STD-1	01	Cornerw	i se- drop		Test	performed	
	Method 50			onal) te			amber.	accelero-
	(4.2.2.1.	7)		on at -4: s than 2:			rop on	meters
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				sultant		•	total of	
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	NTAMER SIZE (L		HES)		IT (LSS)	Cum	t (CU. FT.)	87-P-1	30 DATE
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EM N	AME			- tourist acceptable	MAN	UFACTU	RER	4	. #
	-65 Maveric	k Missile			1				
•	MER NAME						CO	NTAIMER CO	ST .
	-445/F and (CNU-447/E			÷				
	DESCRIPTION								
	ninum Conta: Nommo	iner							
	noted below.								
EST NO.	REF STD/SPE AND TEST METH	IC IOD OR 1	EST TIT	LE AND PA	RAMETER:	 8		AMER TATION	INSTRU- MENTATION
	PROCEDURE N		:			•			•
D.	FED-STD-102 Method 5008		ewise tation	-drop nal) te	est.		Test pe in cham		Tri-axial accelero-
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					inches		bottom		
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		30G		TI HOC	exceed		Test wi	th	
		304					heavies		
c.	FED-STD-10	l Pen	dulum	-impact	test.		One imp	act on	Tri-axial
	Method 5012			n at -6			each si		accelero-
	(4.2.2.1.7)			ure of			each en	*	meters,
				on syst	em at		total o impacts		Thermo- couples
				lest si 10 ⁰ F.	Impact		Test wi		couples
				7 ft/s			heavies		
		dro	p hei	ght 9 i					
				ultant					
			elera		nall no	Ţ.			
	TEAM MECM								
ο.	LEAK TEST FED-STD-10	l Pne	umati	c press	sure wi	th	Ambient		Water
	Method 500				durat				manometer
	(4.2.2.1.1)			than 1					
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CHARG	NTS: ++ These	e edges a	re op	posite vised m	those	impac /TAMI	ted in	Test No.	4a. 4 Aug 87.
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	THE P. L.								

	AIR FORC				ION A	YTIVITY		AFPEA PRO.	JECT NUMBER
		(C	ontainer T	est Plen)				87-P-1	30
CC	NTAMER SIZE INTERIOR:	EXT	(INCHES) TERIOR: 28.5x30	WEIGHT GROSS:	(LBS) ITEM:	CUBE (CU.	. FT.)	QUANTITY	DATE
ITEM N		100%		11	100000	FACTURER		1	10 Mai 00
	-65 Maveri	iole Mice				PACIONER			
	MER NAME	ICK MISS	116		• -			NTAMER CO	
	-445/E and	ONU-4	17 /F					MIABER CO	• 1
	DESCRIPTION		·/E				1		
	minum Cont								
	MITTUM COTT	rainer							
	noted belo	~							
	REF STD/					•			
NO.	AND TEST MI PROCEDUR	ETHOD OR	TEST T	TLE AND PAI	RAMETERS	, ,		TAMER STATION	MSTRU- MENTATION
9.	STACKED S							_	1
	FED-STD-1 Method 50			pendulum Banding d			cked h an	i two	Tri-axial accelero-
	(4.2.2.1			shall be			ded.		meters
	(41212121	-,		klift poo				pact on	me cet b
				channels				nd and	
				of the			h si		
				Impact drop					
			inches.	Peak re	sultar	t Tes			
				ation sha	ll not	hear	vies	st AUR.	
10	IENV MECO	•	exceed	30 Gs.					
10.	LEAK TEST		Pneumat	ic press u	ira wit	h Amb	ient		Water
	Method 50		1.50 PS		durati			•	manometer
	(4.2.2.1	.12)		s than 19					
			minutes	. Leaka	ge rate	!			
				ot exceed after ter		ro			
			stabili		"per a c				
11.	VIBRATION	N FATIGE	E TEST						
	MIL-STD-			xcitation	of	Rig	idly	attach	Tri-axial
	Para 5.3.			nch doub				ner to	accelero-
	(4.2.2.1	. 2)		de or 1G, er is les		exc			meters, Thermo-
				er is le: pproximat				straps	
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				inutes (a		/2			
				min) for . Then o		5			
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	1								
COMM	iNTS: * Impa	act veld	city re	vised per	ASD/T	'AML let	ter	dated 24	Aug 87.
PREPA	RED BY:				APPROV	ED BŸ:		. .	
Larr	y Nugent,	Mechani	cal Eng	ineer	RALPH	ZYNDA,	Chie	ef, Desia	n Br., AFPEA
	1874.4				٥	<u> </u>			PAGE 5 OF 1

		(AGING EVALUATION A	CTIVITY	AFPEA PR	OJECT NUMBER
cc)) ONTAMER SIZE (L x W x t		TOTAL COLE	87-P-	
		TERIOR: GROSS: ITEM:	CODE (CO. P	I./ ; GUARTII T	DATE
		28.5x30		•	18 Mar 8
'EM N			JFACTURER		
	1-65 Maverick Mis	sile	7		
	-445/E and CNU-4	A7/F		CONTAIMER C	OST
	DESCRIPTION	47/E			
Alu	minum Container				
ONDIT	TIONING				
As	noted below.				
TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS		ONTAINER RIENTATION	INSTRU- MENTATION
	•	minutes at the resonal			•
		frequency. The test			
		be interrupted to pre- vent excessive tempera			
		ture rise in materials			
		Transmissibility shal.	1		
		not exceed 5 at the resonance frequency.			
		resonance frequency.			
12.	LEAK TEST FED-STD-101 Method 5009.2	Pneumatic pressure with 1.50 PSI. Test durat		nt	Water manomet e r
	(4.2.2.1.12)	not less than 15 minutes. Leakage rate	e		
		shall not exceed 0.05			
		PSI/HR after temperate stabilization.	ure		
13.	REPETITIVE SHOC	K (SUPERIMPOSED LOAD) Test for not less tha	n Stack	ed two	Tri-axial
	Method 5019.1	two hours at 3 to 5 H			accelero-
	(4.2.2.1.3)	or 1G, whichever is		d, test	meters
		less. Banding of containers shall be through		m con- er. Test	
		the forklift pockets		heaviest	
		in the channels acros	s AUR.		
		the top of the contain			
		er. Transmissibility shall not exceed 5.			
COMM	ENTS:				
REPA	RED BY:	APPRÓV	PĒD BY:		
arr	y Nugent, Mechan	ical Engineer RALPH	ZYNDA, CH	nief, Desi	ign Br., AFPI
	287,4			<u>-</u>	PAGE 6 OF

		(Container T	EVALUATION A Test Plan)		87-P-1	30
	NTAINER SIZE (L x		WEIGHT (LBS) GROSS: ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
•	NTERIOR:	EXTERIOR : 108x28.5x30	GROOD.		!	18 Mar 88
EM NA			MAN	UFACTURER		
AGM-	-65 Maverick	Missile		,		÷ **
NATA	NER NAME			co	NTAINER CO	\$ T
	-445/E and Ch	NU-447/E				
	ESCRIPTION minum Contail	ner				
	IONING					
As r	noted below.					MSTRU-
EST NO.	REF STD/SPEC AND TEST METHO PROCEDURE NO	D OR TEST	TITLE AND PARAMETER	•	TAINER ITATION	MENTATION
4.	LEAK TEST FED-STD-101 Method 5009 (4.2.2.1.12	.2 1.50 PS) not les minutes shall r PSI/HR	tic pressure wi SI. Test durat ss than 15 s. Leakage rat not exceed 0.05 after temperat ization.	ion e	:	Water manometer
15. a.	ROUGH HANDL FED-STD-101 Method 5005 (4.2.2.1.7)	Corners (rotat: Condit: not le: Drop he Peak re	LOW TEMPERATURI wise-drop ional) test. ion at -40°F fo ss than 24 hour eight 20 inches esultant accelo hall not exceed	Test poin chair one dragon bottom era ners, two dragon transfer trans	erformed mber. op on al cor- total of ops. ith st AUR uidance GU) and	accelero- meter
COMM	MÉNT8: ★ Tests	performed	o identify max	imum peak ac	cceler a t:	ion
	exper	lenced by th	ne light <mark>est AUF</mark>	missire.		

AFPEA PROJECT NUMBER AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan) 87-P-130 CONTAINER SIZE (L x W x D) (MCHES) WEIGHT (LSS) CUBE (CU. FT.) QUANTITY DATE GROSS: ITEM: INTERIOR: EXTERIOR: 108x28.5x30 18 Mar 88 ITEM NAME MANUFACTURER AGM-65 Maverick Missile CONTAINER NAME CONTAINER COST CNU-445/E and CNU-447/E PACK DESCRIPTION Aluminum Container CONDITIONING As noted below. REF STD/SPEC CONTAINER WSTRU-AND TEST METHOD OR TEST TITLE AND PARAMETERS NO. MENTATION ORIENTATION PROCEDURE NO'S b. FED-STD-101 Test performed Tri-axial Edgewise-drop Method 5008.1 in chamber. accelero-(rotational) test. Condition at -40°F for One drop on meter (4.2.2.1.7)not less than 24 hours. two adjacent Drop height 20 inches. bottom edges, Peak resultant acceleratotal of two tion shall not exceed drops. Test with lightest 30Gs. AUR w/o GU and AS. c. FED-STD-101 One impact on Tri-axial Pendulum-impact test. accelero-Method 5012 Condition at -65°F. each side and (4.2.2.1.7)Temperature of shock each end. meter, mitigation system at total of four Thermotime of test shall be impacts. couples -40,+0,-10°F. Impact Test with velocity 7 ft/sec*, drop lightest AUR height 9 inches. Peak w/o GU and AS. resultant acceleration

COMMENTS: * Impact velocity revised per ASD/TAML letter dated 24 Aug 87.

shall not exceed 30Gs.

Pneumatic pressure with

minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature

not less than 15

stabilization.

1.50 PSI. Test duration

PREPARED BY:

16.

LEAK TEST FED-STD-101

Method 5009.2

(4.2.2.1.12)

APPROVED BY:

Larry Nugent, Mechanical Engineer

RALPH ZYNDA, Chief, Design Br., AFPEA

Ambient

FALD LAY, 4

Water

manometer

MAMMFACTURER AGM-65 Maverick Missile ONDITIONERS ALUBRINUM Container ONDITIONERS AS NOTED BEILD REFERENCE PROPERTIES PART REFERENCE PROPERTIES OF PROCEDURE MOS PROCEDURE MOS PROCEDURE MOS PROCEDURE MOS PROCEDURE WOS PROCE		AIR FORCE				ION AC	TIVITY	AFPEA PRO	JECT NUMBER
INTERIOR: 108x28.5x30 GROSS: ITEM: 108x28.5x30					Test Plan)				30
MANUFACTURER AGM-65 Maverick Missile ONTARRER NAME CNU-445/E and CNU-447/E AGK OBSCRIPTION ALUMINUM Container ONDITIONING AS NOTED BEION. PROCEDIME NOS PROCEDIME NOS 7. VIBRATION FATIGE TEST (LIGHT MISSILE) HIL-STD-648 Input excitation of para 5.3.2 0.125 inch double amplitude or 1G, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0.+5 minutes about 1/2 octave/min) for 15 minutes. Then dwell 15 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-STD-101 Pneumatic pressure with excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-STD-101 Pneumatic pressure with shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-STD-101 Pneumatic pressure with minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization. 9. APPROVED BY: APROVED BY: APPROVED BY: APPROV	CO		EX	TERIOR:			CUBE (CU. FT.)	QUANTITY	
AGM-65 Maverick Missile ONTANEEN NAME CONTANEEN COST CONTANEEN COST ACK DESCRIPTION Aluminum Container ONDONTORNO As noted below. Test it method on the strict of the	SM N		108x	28.5x30	i		AATURER		18 Mar 8
CNU-445/E and CNU-447/E ACK DESCRIPTION Alluminum Container OMDITIONING As noted below. Est REF STD/SPIC PROCEDURE MO'S 7. VIERATION FATIGUE TEST (LIGHT MISSILE) MIL-STD-648 Input excitation of Para 5.1.2 0.125 inch double (4.2.2.1.2) amplitude or 1G, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0,*5 minutes (about 1/2 octave/min) for 15 minutes. Then dwell 15 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST PED-STD-101 Pneumatic pressure with Method 5009.2 (4.2.2.1.12) (4.2.2.1.12) Pneumatic pressure with 1.50 PSI. Test duration not less tnan 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization. OMMENTS: MEPARED BY: APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFI	AGM:	-65 Maveri	ck Miss	sile		MANO	ACTORER .		
Aluminum Container OMOTIONNO As noted below. Est REF STD/SPEC NO. 14 REF STD/SPEC NO. 14 REF STD/SPEC NO. 15 REF STD/SPEC NO. 15 REF STD/SPEC NO. 16 REF STD/SPEC NO. 16 REF STD/SPEC NO. 16 REF STD/SPEC NO. 17 REF STD/SPEC NO. 17 REF STD/SPEC NO. 17 REF STD/SPEC NO. 18 REF STD/SPEC NO.			CNU-4	17/E			- Co	DNTAINER CO	8 T
REF STO/PEC MO. AND TEST METHOD ON PROCEDURE NO'S 7. VIBRATION FATIGUE TEST (LIGHT MISSILE) MIL-STD-648 Input excitation of Para 5.3.2 0.125 inch double (4.2.2.1.2) amplitude or 1G, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes — 0.+5 minutes (about 1/2 octave/min) for 15 minutes. Then dwell 15 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-5TD-101 Pneumatic pressure with Method 5009.2 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/H after temperature stabilization. OMNUMENTS: MEPARED BY: AMP TEST MITHE AND PARAMETERS CONTAINER ORIGINAL METHOD AND M			ainer				•		
REF STD/SPEC MO. PROCEDURE MO'S PROCEDURE MO'S PROCEDURE MO'S PARATION FATIGUE TEST (LIGHT MISSILE) MIL-STD-648 Input excitation of Para 5.3.2 0.125 inch double amplitude or 16, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0,+5 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-STD-101 Pneumatic pressure with Method 5009.2 (4.2.2.1.12) Pneumatic pressure with Method 5009.2 (1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/MR after temperature stabilization. **APPROVED BY: APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFF									
7. VIBRATION FATIGUE TEST (LIGHT MISSILE) MIL-STD-648 Input excitation of Para 5.3.2 0.125 inch double amplitude or 1G, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0,+5 minutes (about 1/2 octave/min) for 15 minutes. Then dwell 15 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-STD-101 Pneumatic pressure with Method 5009.2 (4.2.2.1.12) PSI. Test duration not less tnan 15 minutes. Leakage rate shall not exceed 0.05 PSI/RR after temperature stabilization. Ambient Water manometer manometer stabilization.	EST	REF STD/S	PEC	TEST 1	TITLE AND PAF	RAMETERS			,
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whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0,+5 minutes (about 1/2 octave/min) for 15 minutes. Then dwell 15 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency. 8. LEAK TEST FED-STD-101 Pneumatic pressure with Method 5009.2 (4.2.2.1.12) Pneumatic pressure with not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization. MEPARED BY: APPROVED BY:									
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Method 5009.2 1.50 PSI. Test duration manometer (4.2.2.1.12) not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization. OMMENTS: APPROVED BY: arry Nugent, Mechanical Engineer RALPH ZYNDA, Chief, Design Br., AFF	8.			_		• •			
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minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization. ONMENTS: REPARED BY: APPROVED BY: arry Nugent, Mechanical Engineer RALPH 2YNDA, Chief, Design Br., AFR						_	on		manometer
shall not exceed 0.05 PSI/HR after temperature stabilization. OMMENTS: REPARED BY: APPROVED BY: arry Nugent, Mechanical Engineer RALPH 2YNDA, Chief, Design Br., AFR		(4.2.2.1.	12)						
PSI/HR after temperature stabilization. OMMENTS: REPARED BY: APPROVED BY:									
OMMENTS: REPARED BY: APPROVED BY:							re		
OMMENTS: REPARED BY: APPROVED BY: BY: APPROVED BY: APPROVED BY: APPROVED BY: APPROVED BY: APPROVED BY:						nperaea			
APPROVED BY: arry Nugent, Mechanical Engineer RALPH ZYNDA, Chief, Design Br., AFR									
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APPROVED BY: Arry Nugent, Mechanical Engineer RALPH ZYNDA, Chief, Design Br., AFR									
arry Nugent, Mechanical Engineer RALPH 24NDA, Chief, Design Br., AFR	CAMAG	ints:							
	REPAI	RED BY:				APPROVE	D BY:		
	arry	y Nugent,	Mechan:	ical Eng	ineer	RALPH	ZYNDA, Chi	ef, Desig	n Br., AFPE
THE U O						•			PAGE 9 OF

AIR FORCE PACI	KAGING EVALUATION ACT	YTIVI	AFPEA PROJ	ECT NUMBER
((Container Test Plan)		87-P-13	30
CONTAINER SIZE (L x W x		UBE (CU. FT.)	QUANTITY	DATE
	TERIOR: GROSS: ITEM:			18 Mar 88
EM NAME	MANUFA	CTURER	*	•
AGM-65 Maverick Mis	sile			
ONTAINER NAME	·	CO	MTAMER COS	T
CNU-445/E and CNU-4	47/E		_	
ACK DESCRIPTION				
Aluminum Container				
As noted below.				
EST REF STD/SPEC NO. AND TEST METHOD OR PROCEDURE MO'S	TEST TITLE AND PARAMETERS		TAMER STATION	INSTRU- MENTATION
9. FREE FALL DROP	TEST	•		
(4.2.2.1.9)	Band two containers	Stacked		Tri-axial accelero-
	together. Flat drop from 18 inches. Peak	high anded		meters
	resultant acceleration	bottom	•	
	shall not exceed 30Gs.	tainer		
		Test w heavie		
O. LEAK TEST		Ambien	.	Water
FED-STD-101 Method 5009.2	Pneumatic pressure with 1.50 PSI. Test duration	• • • •	L .	manometer
(4.2.2.1.12)	not less than 15			
·	minutes. Leakage rate			
	shall not exceed 0.05 PSI/HR after temperatur	e		
	stabilization.			
21. SUPERIMPOSED L	OAD	~		Visual
FED-STD-101 Method 5016.1	Condition container at +140°F prior to test.		onducted mber at	inspection
(4.2.2.1.8)	Stack two containers	+140°F	. Stack	- · •
(4,2,0,2,0)	with additional load or		gh, test	
	top to simulate stacking to containers or 16 ft	ng bottom tainer	con- Test	
	high, whichever is		eaviest	
	greater. Load equals	AUR.		
	load on bottom contained			
	times a factor of safet	ty		
	of 2. Additional load placed on top container	r		
	such that the total loa			
COMMENTS:				
	APPROVE	ID SY:		
PROPARED BY: Larry Nugent, Mecha			ief. Desi	gn Br., AFPI
AFALD 2014	miles buyinest posses	_ , , , , , , , , , , , , , , , , , , ,		PAGE 10 OF

	AIR FORCE PACE	VITY	AFPEA PROJECT NUMBER				
		Container Test Plan)		87-P-1	30		
C	ONTAINER SIZE (L x W x I	i	JOE (CU. FT.)	QUANTITY	DATE		
		TERIOR: GROSS: ITEM: 28.5x30			18 Mar 88		
FEM N		MANUFAC	TURER		120		
AGM	-65 Maverick Mis	sile					
ONTA	MER NAME		CO	NTAINER COS	T		
	-445/E and CNU-4	47/E					
	DESCRIPTION						
	minum Container TIONNA						
As	noted below.						
TEST	REF STD/SPEC		CONT	AMER	R MSTRU-		
NO.	AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS		TATION	MENTATION		
	• · · · · · · · · · · · · · · · · · · ·	is carried by the	•				
		stacking provisions.					
	,	Test duration not less than 1 hour. There			3		
		shall be no permanent					
		deformation.					
22.	PUNCTURE RESIST	NCF TEST					
	MIL-STD-1489A	Impact will be made at a			Visual		
	Method 505	point 1/2 inch above the			inspection		
	(4.2.2.1.20)	enclosed forklift pocket of the container base.	each en	_ : -			
		There shall not be any		otal of			
		damage affecting con-	four im	pacts.			
		tainer performance.	Test wi heavies				
•							
23.	LEAK TEST FED-STD-101	Pneumatic pressure with	Ambient		Water		
	Method 5009.2	1.50 PSI. Test duration			manometer		
	(4.2.2.1.12)	not less than 15					
		minutes. Leakage rate shall not exceed 0.05					
		PSI/HR after temperature					
		stabilization.					
	4						
COMM	ENTS:		•		•		
PREPA	ARED BY:	APPROVED I	DY:				
Larr	y Nugent, Mechan	ical Engineer RALPH ZY	NDA, Chie	f, Desia	n Br., AFPE		
	0 1894, 4				PAGE 11 OF		

AFPEA PROJECT NUMBER AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan) 87-P-130 CONTAINER SIZE (L x W x D) (INCHES) WEIGHT (LBS) CURE (CU. FT.) QUANTITY DATE MITTENOR: EXTERIOR: GROSS: ITEM. 108x28.5x30 18 Mar 88 ITEM NAME MANUFACTURER AGM-65 Maverick Missile CONTAINER MAME CONTAINER COST CNU-445/E and CNU-447/E PACK DESCRIPTION Aluminum Container COMDITIONING As noted below. REF STD/SPEC TEST CONTAINER MSTRU-AND TEST METHOD OR PROCEDURE NO'S TEST TITLE AND PARAMETERS NO. MENTATION ORIENTATION 24. MECHANICAL HANDLING TESTS a. FED-STD-101 Forklift handling test. One container Visual Method 5011.1 Lift container(s) off from one side inspection Paragraph 6.2 and one end. ground with times in-(4.2.2.1.10)clined 15 degrees and Repeat with stack restrained to two stacked prevent sliding. Carry containers 100 ft in 23 seconds. from the side Place two parallel 2x4s only. Test 54 inches apart in the with heaviest path as follows: 30 ft AUR. from the start, square to the path; 60 ft from the start, at a 60° angle such that the left wheel strikes first; 90 ft from the start, at a 750 angle such that the right wheel strikes first. The container(s) shall remain stable on the tines during the test. There shall be no structural damage. b. FED-STD-101 Forklift pushing test. From one side Visual Method 5011.1 The times should extend and one end of inspection under but not support Paragraph 6.5 container. (4.2.2.1.10) the container. Push on Test with hard surface 35 ft in 85 heaviest AUR. seconds. There shall be no structural damage. COMMENTS: PREPARED BY: APPROVED BY: Larry Nugent, Mechanical Engineer RALPH ZYNDA, Chief, Design Br., AFALD STY, 4 PAGE 12 OF 18

		(Container 1	'est Plan)			87-P-1	.30
	NTAMER SIZE (L x V		WEIGHT (LBS)		CU. FT.)	QUANTITY	DATE
(NTERIOR:	EXTERIOR: 08x28.5x30	GROSS: ITEM				18 Mar
EM NA			MAI	NUFACTURE	 IR	1	4
AGM	-65 Maverick	Missile					
NTAI	NER NAME		چينه الهادي د جانب		CO	NTAINER CO	BT
CNU	-445/E and CN	U-447/E			;		
CK D	ESCRIPTION						
Alu	minum Contain	er					
	IONING						
As :	noted below.			··· •		· · · · ·	_
18T 10.	REF STD/SPEC AND TEST METHOD PROCEDURE NO'S	ETHOD OR TEST TITLE AND PARAMETERS		RS .	CONTAINER ORIENTATION		MISTRU- MENTATION
C.	FED-STD-101		t towing test		rom er		Visual
	Method 5011.	- ,2	towing rings 3 seconds. T				inspection
	Paragraph 6. (4.2.2.1.10)		e no structur		nly. ith he	rest aviest	1
	,,	damage.	· · · · · · · - · · ·	,	UR.		1
<u>.</u>	UOICTING COD	ENGTH TECT					
5. a.	HOISTING STR		g beam test.	т	est wi	th	Visual
	(4.2.2.1.11)		ontainer load			t AUR.	inspectio
			e times the g				-
			with HLU 216/				
			cradle hoist e minutes. T	beam : here .			
			e no damage o				1
		permane	nt deformatio	n.			1
b.	MIL-STD-648	MK-45]	ifting test.	T	est wi	th	Visual
	Paragraph 5.	10 Lift co	ntainer loade	d to h			inspection
	(4.2.2.1.11)		imes the gros				
			with the MK-4 ft truck for				
		minutes	· · · · · · ·				
			ge or permane				
		deforma	tion.	1			
c.	MIL-STD-648	Sinale	ring hoisting	: T	est wi	th	Visual
- •	Paragraph	test.	Hoist contain	er 🥻 h		t AUR.	inspectio
	5.8.5		lift point an				-
	(4.2.2.1.11)	leave h	anging for fi				
			. There shal ge or permane				
		deforma		;			
•				į			
		1					1
المستد	·	:		1			1
MAKE	NTS:						
	ED BY:		- Landson	YED BY:			
	y Nugent, Mec			75V UT:			

	MTAINER SIZE (L x W		WEIGHT (CUBE	(CU. FT.)	87-P-1	DATE
	INTERIOR:	EXTERIOR: 08 x28. 5x30	GROSS:	ITEM:				18 Mar
EM N	AME	· · · · · · · · · · · · · · · · · · ·		MANU	FACTUR	ER		
AGM	I-65 Maverick I	fissile						
ATM	MER NAME					CO	NTAMER CO	FT
	-445/E and CNI	J-447/E						
	ESCRIPTION	-						•
	minum Containe	er						
	IONING							
λs	noted below.	and the same of th						
:8T Ю.	REF STD/SPEC AND TEST METHOD PROCEDURE NO'S	METHOD OR TEST TITLE AND PARAMETERS			CONTAINER ORIENTATION		MSTRU- MENTATION	
đ.	MIL-STD-648		ing hoisti		it.	Stacked	i two	Visual
}	Paragraph		Hoist two banded con- tainers loaded to ten				nđ	inspection
	5.8.3 (4.2.2.1.11)		s loaded to the gross o			banded. Test w:	•	
	(4.2.2.1.11)		ingle conta				st AUR.	•
		all li	ft points	simul-				
			sly and lea	ave	· {			
			g for five s. There:	chall	ho			
;			age or per					
		deform			1			
6.	LEAK TEST	•			;			
٠.	FED-STD-101	Pneuma	tic pressu	re wit	h .	Ambient	Ł	Water
	Method 5009.2	1.50 P	SI. Test (manometer
	(4.2.2.1.12)		ss than 15 s. Leakage	+-				
			not exceed					
			after tem	peratu	re !			
		stabil	ization.		:			
7.	COVER HANDLE	PULL TEST			į			
	(4.2.2.1.17)	Apply	a force of			Am bient	<u>:</u>	Scale
			over handle ions that s					
			are possib		: e			
			shall be no		ige			
			manent defe	orma-				
		tion.			i			1
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أحمد		_			!			ļ
	NTS:							
	ED SY:	magasta ay sama a ta	T	PPROVE				
arr	y Nugent, Mech	anical Eng	gineer	RALPH	ZYND	A. Chie	f. Desig	n Br., AFP

•	AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)						27 7 22		
				41.001	CUBE (C		87-P-1		
CO	NTAMER SIZE (L x W x D INTERIOR: EXT)) (INCHES) TERIOR:	WEIGHT	(LBS)	CUBE (C	J. PT.)	QUARTITY	DATE	
		28.5x30			i		1	18 Mar 8	
MN	AME		-1	MANU	FACTURER		• -		
AGM	-65 Maverick Mis	sile							
NTA	MER NAME			:		CO	NTAINER COS	ST	
CNU	-445/E and CNU-4	47/E							
	ESCRIPTION					. 1			
Alu	minum Container								
	TOMMA								
As	noted below.								
	REF STD/SPEC								
8T 0.	AND TEST METHOD OR	TEST TITLE AND PARAMETERS			, ,	CONTAINER		MENTATION	
	PROCEDURE NO'S	MP.C.			· •			· · · · · · · · · · · · · · · · · · ·	
В.	CONDUCTIVE PATH (4.2.2.1.13.1)		ater than	0.10) Ami	bient		Ohmmeter	
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AFALD 1874.4

APPEA PROJECT NUMBER AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan) 87-P-130 WEIGHT (LBS) CUSE (CU. FT.) QUANTITY CONTAINER SIZE (L x W x D)(INCHES) DATE GROSS: ITEM: INTERIOR: EXTERIOR: 18 Mar 88 108x28.5x30 ITEM NAME MANUFACTURER AGM-65 Maverick Missile CONTAINER NAME CONTAINER COST CNU-445/E and CNU-447/E PACK DESCRIPTION Aluminum Container CONDITIONING As noted below. REF STD/SPEC CONTAINER MISTRII-AND TEST METHOD OR TEST TITLE AND PARAMETERS MENTATION ORIENTATION PROCEDURE NO'S 30. STAND-OFF TEST Visual Place load two times the Place con-(4.2.2.1.18)cover weight on cover. tainer cover inspection The cover shall not on a concrete deform or deflect. With floor resting load removed, slide on the standcover on the stand-offs offs. five feet in each of four different directions. There shall be no damage to the sealing surface. 31. LEAK TEST FED-STD-101 Pneumatic pressure with Ambient Water 1.50 PSI. Test duration Method 5009.2 manometer (4.2.2.1.12)not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization. 32. RAIN WITH WIND TEST*** Rain at four inches per One hour with hour, wind velocity 40 each side and miles per hour. Test end facing into the wind Visual MIL-STD-810 inspection Method 506.2 Procedure 1 duration four hours. into the wind, total of four There shall be no water intrusion. hours. Test with heaviest AUR. COMMENTS: *** Added at the request of ASD/TAML. PREPARED BY: APPROVED BY: Larry Nugent, Mechanical Engineer RALPH ZYNDA, Chief, Design Br., AFPEA 9.37.4 PAGE 16 0 18

•	AIR FURCE			VALUAT	ION A	CTIVI	TY	AFFEA PRO	JECT NUMBER
CONTAINER SIZE (L x W x			(Container Test Plan)					87-P-1	
	ntainer size (Interior:	EXT	ERIOR:	GROSS:	(LBS) ITEM:	CUSE	(CU. FT.)	QUANTITY	DATE
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		- CNT1 - 4	47 /E				CO	MIAMER CO	• 1
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	noted belo	5 W							
	REF STD/S							· · · · · · · · · · · · · · · · · · ·	
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AFALD STY, 4

CC	MTAMER SIZE		ontainer T		(LBS)	CUBE (CU. F	87-P-1 T. QÜÄNTIYŸ	
	INTERIOR:	,	TERIOR: 28.5x30	GROSS:	ITEM		ł	18 Mar 88
EM N	AME	108%	. O. JAJU	1	MANU	FACTURER	1	
	-65 Maver	ick Miss	sile					-
	MER NAME	3 0071 4	17/2			;	CONTAINER CO	98 T
	-445/E an	d CNU-4	1/E					
lu	minum Con	tainer						
	TIONING							
	noted bel					,		
E87 10.	AND TEST M	ETHOD OR	TEST T	ITLE AND PAI	RAMETERS	-	ONTAINER BENTATION	MENTATION
•	•	T TREUE	missile	e removal shall al or reject	so be	e		•
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7.	SEAL INT (4.2.2.1 (4.2.3)		test sh failure perform success regardl results	to pass all const of all t ed after ful leak ess of th or reject a of the	titute tests the la test he ction	st		
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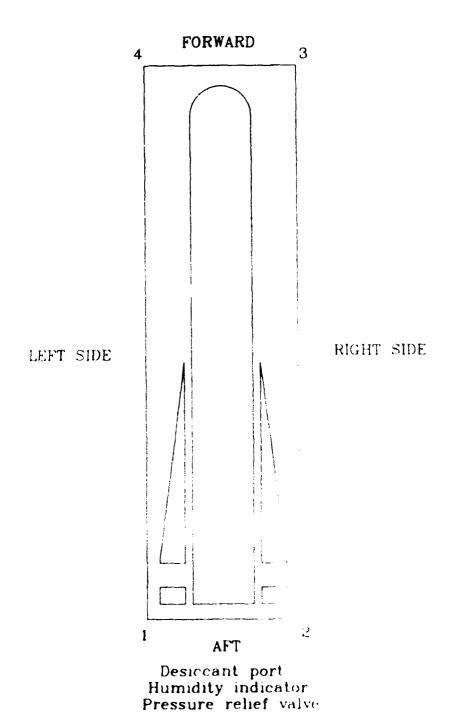


Figure 1. CNU-445/E and CNU-447/E corner numbering.

Figure 2
CNU-445/E prototype
with heavy test load.



Figure 1
Cover of CNU-445/E.



Figure 4
CNU-447/E prototype.

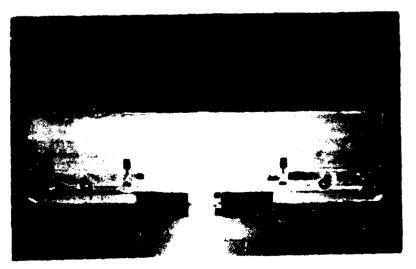


Figure 5
CNU-447/E forward clamp.



Figure 6
Light missile test load.



Figure 7
Flight trainer test load.



Pigure &

High temperature pendulum-impact test.



Pigure 9

Low temperature edge drop test.



Pigure 10

Set-up for vibration fatigue test (prior to securing to table).

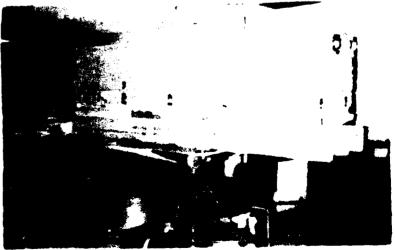
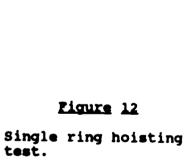


Figure 11
Cover handle pull test.



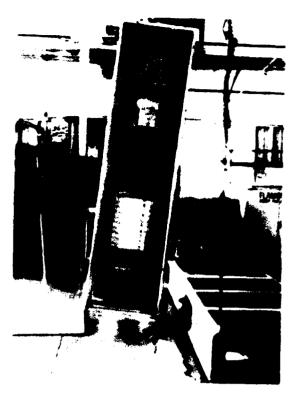
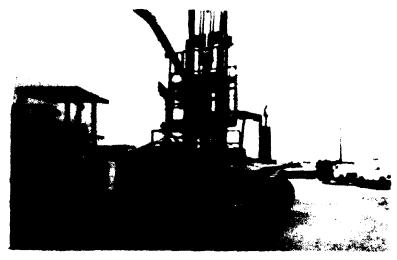




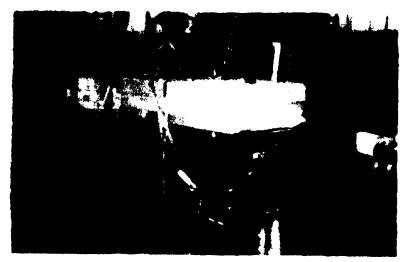
Figure 13
Puncture resistance test.



Four ring hoisting test.



Pigure 15 Banded flat drop test.



Pigure 16
MK-45 lifting test.

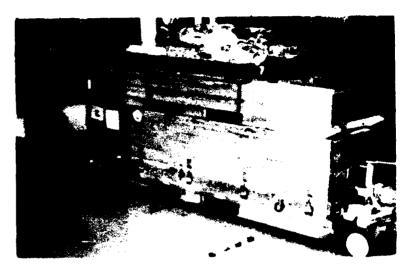


Figure 17
MK-45 lifting provision damage.



<u>Figure 18</u>
Container angle in rain chamber.



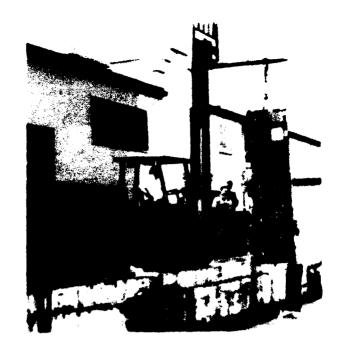
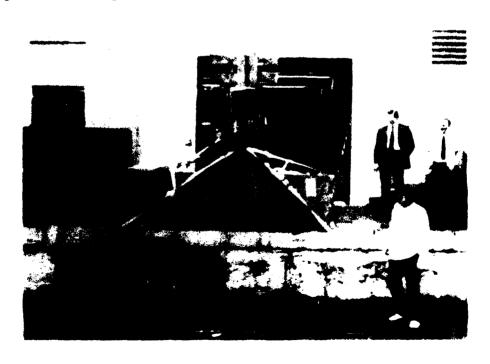


Figure 19
UN drop test set-up.

Figure 20
UN drop test set-up.



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AFWAL-TM -87-203-FIBT

MAVERICK MISSILE CONTAINER TIE-DOWN STRENGTH TEST

2 LT DAVID J. KRIER MR. FRED HUSSONG

STRUCTURES TEST BRANCH STRUCTURES DIVISION

NOVEMBER 1987

T ROST WANTED

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

FLIGHT DYNAMICS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

FOREWORD

This report was prepared by the Structures Test Branch, Structures Division, Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio. It is a formal record of the testing conducted on two Maverick Missile Containers. One was tested for the Air Force Packaging Evaluation Agency, and the other was tested for the Maverick Missile Systems Program Office.

The test program at the Structures Test Branch was directed by 2 Lt. David J. Krier as Project Engineer and Mr. Fred Bussong as Instrumentation Engineer. Technical assistance was provided by Miss Suzanne Westfall, Mr. Rick Parmer, and Mr. Mark Pennywitt.

This report has been reviewed and is approved for publication.

SANFORD LUSTIG Chief, Structures Test Branch Structures Division

ABSTRACT

This report describes the structural tests performed on two Maverick Missile Containers. The objective of the test was to verify the structural integrity of the tie-down provisions on each container. The tests proved that these provisions were adequate.

TABLE OF CONTENTS

SECTION				<u>P.</u>	GE	NO.
	FOREWORD		•			. i
	ABSTRACT					. ii
	TABLE OF CONTENTS					. iii
I.	INTRODUCTION		•			. 1
11.	TEST SET-UP		٠			. 1
111.	TEST PROCEDURE					. 2
1 V .	TEST RESULTS AND PROCEDURES	•				. 2
٧.	FIGURE 1 - TEST SET-UP					. 3
	FIGURE 2 - LOADING DIAGRAM					. 4
	FIGURE 3 - LOAD REPORT					. 5

I. INTRODUCTION

The Air Force Packaging Evaluation Agency requested that a tie-down strength test be performed on two Maverick Missile containers. One of the containers was their own, while the other was from the Maverick Missile Systems Program Office. The containers were of different designs, one being made of metal, the other of fiberglass. The tie-down locations were nearly identical on the two containers, so only one test fixture was necessary to test both of them.

In accordance with MIL-A-8421F, in the absence of crearly defined tie-down procedures, the loads were applied at an angle 450 downward from the horizontal and simultaneously 450 outward from the container surface. The testing was conducted at the Structures Test Branch on 1 October 1987.

II. TEST SET-UP

A. MECHANICAL

Figure 1, Test Set-Up, shows the test fixture that was built to apply the loads. Four Parker-Hannitin 2-inch hydraulic cylinders, one at each of the four tie-down rings, were connected in parallel to a single control channel of an Edison Hydraulic Load Maintainer.

Figure 2, Loading Diagram, shows the maximum applied load and the components of that load in the lateral, forward, and down directions. This figure also shows the distances between the

tie-down ring and the base attachment of the hydraulic cylinder.

B. INSTRUMENTATION

The instrumentation consisted of four load cells, one in line with each hydraulic cylinder. Each load cell had a capacity of 5000 pounds.

III. TEST PROCEDURE

The load was increased from 0 pounds to 3374* pounds in each cylinder in 10 percent increments (of maximum load). At each increment, the load was held for one minute. After the 100 percent condition had been applied for one minute, the load was released.

* See Figure 3, Load Report. 3374 pounds is the average of the four applied loads.

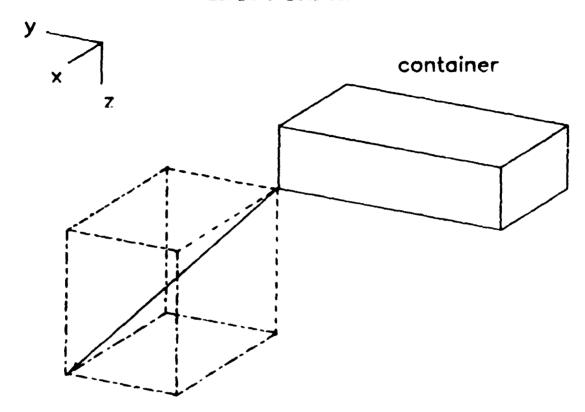
IV. TEST RESULTS AND CONCLUSIONS

No failure of the tie-down rings occurred on either container. No cracking or physical damage was noted during or after the tests.

MIL-A-8421F requires that loads applied to the tie-down rings be based on the gross weight of the container and sissile, and the number of g's the container experiences in certain directions. Figure 3, Load Report, shows that each of the components of applied load met or exceeded those required by MIL-A-8421F. The gross weight used for the test was 1121 pounds.



FIGURE 2 LOADING DIAGRAM



COMPONENTS OF APPLIED LOAD (RED) ---- Fx = 1681 lb Fy = 1681 lb Fz = 2378 lb APPLIED LOAD (PURPLE) --- Fr = 3363 lb DISTANCES OF PULL POINTS (BLUE) ---- dx = 32 in dy = 32 in dz = 46 in

FIGURE 3

LOAD REPORT

The loads in each of the four cylinders were individually measured. The cylinders were connected to one control channel, so the loads applied in each cylinder were nearly equal. For clarity, the applied loads shown below are the average of the four applied loads.

	FWD	AFT	LAT	UP
MIL-A-8421F Requirements (Loads applied to container)	3 g's 3363 1b.	1.5	1.5 1681	2 2 2 4 2
MIL-A-8421F Requirements (Loads applied per tie-down)	1681 15.	840	840	561
Applied load per tie-down	1687 15.	844	844	563

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS ARMAMENT DIVISION (AFSC) EGLIN AIR FORCE BASE, FLORIDA 32542-5000

REFER TO

ATTN () YNP

SUBJECT.

CNU-447/E Test Report

AFPEA/DSTZT

- 1. The following tests were successfully completed on the CNU-447/E container at Eglin AFB. The data submitted below is to be incorporated into your final test report of the CNU-445/E and CNU-447/E.
- a. 46° Certification Drop. This test was successfully completed on 4 December 1987 with no major damage noted. The container did not spill the contents. (see photo 1)
- b. MK+45 Hand Lift Truck Test. This test was successfully completed on 4 Feburary 1988 with the following results:
- (1) Test: Lift Test (static). A superimposed load of 2250 pounds was placed on the fully loaded container. A MK-45 hand truck was used to lift the total load off the floor and allowed to stand for 5 minutes. (see photo 2)

Results: There was no deformation to the fittings or container. The results were acceptable.

(2) Test: Impact Test. The fully loaded container was placed on a one inch steel plate. A MK-45 hand truck was used to raise the container 3 inches off the plate. The container was rolled off of and onto the steel plate 4 times. (see photo 3)

Results: There was no deformation to the container. The results were acceptable.

Note: This test was not required by the test plan. However, this test is specified in MIL-STD-648A.

c. HLU-216 Sling Lift Test. On 2 Feburary 1988 a dummy loaded CNU-445/E container was secured to the base of the fully loaded CNU-447/E container. A lifting bar, made in-house, was secured to the HLU-216 lift points and the two containers (gross weight 3520 lbs) were lifted off the floor and allowed to hang for 5 minutes. (see photo 4)

Results: The test results were acceptacle. There was no deformation of the fittings or the container.

2. Please contact Guy Clark (AUTOVON 872-3779) if you require additional information.

WALTON A. ORR, PhD Director Pkg & Transp

Dep for Armament Equipment

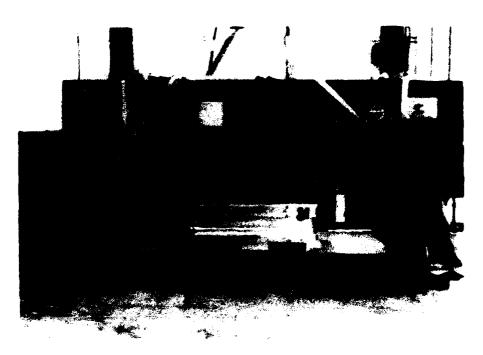
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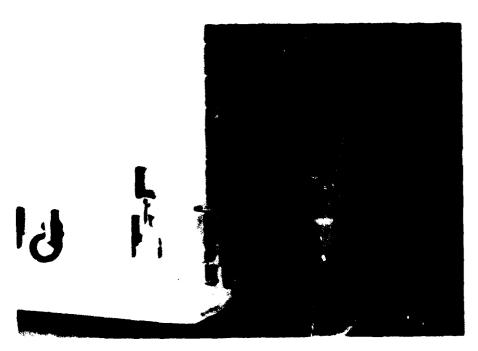
1. 48" Certification Drop Photo

2. Lift Test Photo

3. Impact Test Photo
4. HLU-216 Sling Lift Test Photo



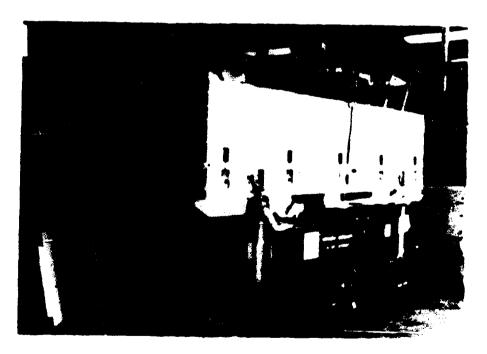
Attachment 1



Attachment 2



Attachment 3



Attachment 4

CNU-445/E CONTAINER - DETAILED ACCELERATION RESULTS

HIGH TEMPERATURE ROUGH HANDLING TESTS (+140°F)

Impact	Position	Accelerometer Fore	readi CG	ngs (Gs) Aft
20" rotational drop 20" rotational drop 20" rotational drop	Corner 4 Edge 3-4 Corner 2	28.4 5.5	10.4 15.8 10.0	16.0 13.3 14.4
20" rotational drop 7 ft/sec pendulum-impact 7 ft/sec pendulum-impact	Edge 1-4 Edge 2-3 Edge 1-2	6.6 8.2 13.7	8.9 8.7 15.8	11.7 9.8 10.1

- CG accelerometer loose when the container was opened.
 The missile rotated to the right slightly.
 Putty placed on the missile fins prior to the test showed that there were small clearances between the missile and the container, but there was no contact.

LOW TEMPERATURE ROUGH HANDLING TESTS (-40°F)

Impact	Position	Accelerometer Fore	readings CG	(Gs) Aft
20" rotational drop	Corner 3		13.6	20.3
20" rotational drop	Corner 3		12.6	16.1
20" rotational drop	Corner 1	11.3	18.1	28.1
20" rotational drop	Edge 1-2	8.6	21.3	
20" rotational drop	Edge 2-3	15.6	15.6	18.7
7 ft/sec pendulum-impact	Edge 3-4	28.1	17.6	22.6
7 ft/sec pendulum-impact	Edge 1-4	13.7	14.4	12.9

1. No damage to the container or the missile test load.

VIBRATION FATIGUE TEST

Natural frequency 11.5 Hz

(input: 0.85G peak, 0.125 inch double amplitude)

	Fore	CG	Aft
Maximum Acceleration (Gs, peak to peak) Maximum Transmissibility		5.7 3.4	

1. No damage to the container or the missile test load.

IAW	TEMPERATURE	ROUGH	HANDLING	TEST	(-40°F).	LIGHT MISSIL	3
LOW	IEMPERATURE	ROUGR	DVITTIG	1631	(-40 2/1	TITOUT MITOCITA	م

Impact	Orientation	CG Accelerometer (Gs)			
20" rotational drop	Corner 1	24.2			
20" rotational drop	Edge 1-2	28.8			
20" rotational drop	Corner 3	15.8			
20" rotational drop	Edge 1-4				
20" rotational drop	Edge 1-4	21.9			
7 ft/sec pendulum-impact	Edge 2-3	13.8			
7 ft/sec pendulum-impact	Edge 3-4	11.6			
7 ft/sec pendulum-impact	Edge 1-4	16.6			
7 ft/sec pendulum-impact	Edge 1-2	19.7			

1. No damage to the container or the missile test load.

VIBRATION FATIGUE, LIGHT MISSILE

Natural frequency 24 Hz (input: 1.0G peak)

CG

Maximum Acceleration (Gs, peak to peak) 7.8
Maximum Transmissibility 3.9

1. Forward silicone pad between missile and cradle off.

STACKED PENDULUM IMPACT, BANDED

Impact		Orienta	ation	CG	(Gs)		
		pendulum-impact	Edge			9.8	
7	ft/sec	pendulum-impact	Edge	2-3		12.5	
7	ft/sec	pendulum-impact	Edge	3-4		9.3	
7	ft/sec	pendulum-impact	Edge	1-2		14.6	

1. No damage to the container or the missile test load.

REPETITIVE SHOCK, BANDED

Input 4.3 Hz, 1.0 inch double amplitude, 0.95G peak

						(CG
Maximum	Acceleration	(Gs,	peak	to	peak)	•	6.0
Maximum	Transmissibil	lity	_				3.2

1. No damage to container or the missile test load.

BANDED FLAT DROP

Trainer missile, strapped instead of banded

Acceleration at CG (Gs)

18" flat drop

19.7

1. No damage to the container or the missile test load.